

The Origin and Evolution of the Grand Forks Human Nutrition Research Center, 1970-90¹⁻⁴

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Abstract

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In the early 1960s William E. Cornatzer, MD, PhD suggested the need for increased USDA research concerning human nutrition and creation of the Grand Forks Human Nutrition Laboratory (later the Grand Forks Human Nutrition Research Center). He shared ideas with Senator Milton R. Young of North Dakota who requested that the Agricultural Research Service (ARS) prepare a proposal for such a program. In 1963 Senator Young submitted the proposal that included construction of regional centers to the U.S. Senate. The Grand Forks Human Nutrition Laboratory began operation in 1970. The attentions of Senator Young, Representative/Senator Mark Andrews, and Senator Quentin Burdick concerning the budgetary and construction needs facilitated development of the Center from its inception through 1990. Success of the enterprise rests on the creativity, industry, and other qualities of the Center's scientists and support staff, and collaborators at cooperating institutions. Their work resulted in a greater understanding of trace element nutrition and it role in human health. J. Nutr. 139: 173-177, 2009.

Introduction

The initial conception of the Grand Forks Human Nutrition Research Center (GFHNRC)⁷ originated with William E. Cornatzer, MD, PhD, Professor and Head of the Department of Biochemistry and Director of the Ireland Research Laboratory, University of North Dakota (UND) School of Medicine (1). His thoughts resulted in part from his 1962 visit to the USDA Agricultural Research Service (ARS) nutrition research laboratories in Beltsville, MD at a time when he was a member of the USDA Human Nutrition and Consumer Use Research Advisory Committee. Dr. Cornatzer shared his concerns and perception of the need for an enhanced program of human nutrition research within USDA, which included the establishment of a USDA human nutrition research laboratory on the campus of the UND, with Senator Milton R. Young as described in a September 24, 1970 letter to Dr. Cornatzer from Senator Young that said, "Actually, this whole thing originated when you, EJ Tainter (Grand Forks businessman), and Dean (Theodore H.) Harwood

It seems likely that Dr. Cornatzer's interest and concerns about human nutrition were informed by his experiences as a youth and as a student in biochemistry and medicine. He was born September 23, 1919, in Mocksville, NC, population ~<5000, in Davie County, population ~14,000. Poverty and malnutrition were common in rural North Carolina in the 1920s and 30s. His PhD in biochemistry (1944, University of North Carolina) and MD (1951, Bowman Gray Medical School) gave him basic and clinical understanding of the critical importance of nutrition for human health.

Later in 1962 Drs. Cornatzer and Harwood testified to the Senate Subcommittee on Appropriations about human nutrition research for the 1963 USDA appropriation bill HR12648. In his written statement, Dr. Cornatzer began, "There is a great need for an expanded program of research in nutrition," and reminded the committee of the USDA's responsibility "for the nutritional well-being of our people." After briefly summarizing

⁽MD, Dean, UND School of Medicine) came down to LaMoure to see me quite a few years ago. If it had not been for your initiative this laboratory never would have been a reality. There were two ladies with doctor's degrees in nutrition in the Agricultural Research Service (ARS) several years ago who did a lot of work in getting a major research laboratory in Beltsville and plans for two others in the field-and one they had in mind is now located in Grand Forks. After they retired, no one else pushed very hard for these laboratories and the one at Grand Forks is the only one that has been constructed and is probably the only one that will be for some time. Actually, there is more need for emphasis on nutrition and nutritional research now than when they were carrying on their campaign for adequate laboratory facilities" (1).

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Supplemental Tables 1-5 and associated literature citations are available with the online posting of this paper at jn.nutrition.org.

⁷ Abbreviations used: ARS, Agricultural Research Service; CAS, Committee on Agricultural Sciences; CRIS, Current Research in System; GFHNRC, Grand Forks Human Nutrition Research Center; UND, University of North Dakota.

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the importance of nutrition, he concluded by saying, "I visited the nutritional facilities at Beltsville in the summer of 1962 and found them in need of additional space, equipment and staff. Even if there was not to be an expanded program of nutrition there is a need for a new nutritional laboratory with an increase of laboratory space, additional scientific equipment, and staff. There was no nutrition library at Beltsville. The researcher has to have a library near by; preferably in the same building." "I personally think that the nutritional laboratory should be located on a university campus. This would stimulate productivity, as it becomes part of the scientific community. A research laboratory contributes to the training of graduate students for research and this way we have the stimulation of ideas that spark creativity. The location of a nutrition laboratory on a medical school campus would be ideal. The medical school staff will have biochemists, nutritionists, and physiologists, which can aid in the supervision of research and contribute to the stimulation of ideas that spark creativity. The medical school will already have the library which is an essential part of a research laboratory and thus dispense with the duplication of this expensive item." In his oral testimony, Dr. Cornatzer noted limitations in knowledge concerning human nutrition and reiterated the need for a USDA Human Nutrition Research Laboratory (2).

Senator Young responded by asking, "Am I right in assuming that we have done more by way of research in nutrition for livestock and poultry than we have for human beings (3)?" Cornatzer answered, "Yes, this is very true, Senator. We have done very little in human nutrition as a whole, both in minerals and trace elements, and certainly in the amino acid and protein direction. And, of course in terms of disease, this is a whole field, and much work can be done in these areas."

In his testimony, Dr. Harwood reviewed the importance of human nutrition from a medical perspective and indicated the interest of the UND School of Medicine in a proposed laboratory. He said, "We feel right in North Dakota, with our medical school, with a very active biochemistry department doing good work, having national recognition, it would be an asset to a program like this (4)."

Subsequently, Senator Richard Russell, subcommittee chairman, asked Hazel K. Stiebeling, PhD, representing the ARS, "Is any work being done by HEW under these enormous appropriations we have given them for every conceivable health purpose for the last 10 y (5)?" She answered, "Considerable work is being done by the National Institutes of Health." "The Department of Agriculture has also been working in this field for some 70 y. The programs, I must admit, are inadequate to meet the needs of agriculture or of health." Then, reviewing nutrition research needs, she said, "It seems to me that there are two major aspects to the problem. One is better understanding of the foods as they are produced under different conditions, as they are handled, or processed, both commercially and in the house, under different conditions. There are some 2,000 or more items of food that come to the consumers' tables today. There will be more in the future, I am sure. Each of those should be investigated in terms of some 50 or so nutritional essentials. We have only begun to scratch the surface of that information. We also need information on the nutritional requirements for foods and nutrients at different stages of the life span, which both Dr. Cornatzer and Dr. Harwood have referred to, and how the foods which are produced can be combined so as to meet those nutritional requirements successfully (6)."

On September 12, 1963 Senator Young presented to the U.S. Senate a "Proposed Program for Expanded Research in Food and Nutrition" that had been prepared by the ARS at his request

(7). Although the responsible persons in the ARS are not identified, Edith Weir, PhD, and/or Callie Mae Coons, PhD, are likely authors (P. Swan, personal observation). The concept was consistent with the establishment of ARS research laboratories on the campuses of land grant universities. This proposal differed in that it envisioned placing human nutrition research laboratories on or near the campuses of medical schools.

The proposal (7) stated on page 2 that the program would, "help meet national requirements for food and nutrition research during the next three years." Specifically, manpower would be increased from 80 to 148 scientists; program funds would increase from \$1.93 million to \$9.2 million, including \$4 million for extramural contracts and grants; and \$8.92 million would be provided for new research facilities, including 3 regional laboratories (\$1.9 million), each with a professional staff of 15–20 scientists.

Legislative authority (7), page 7, "derives from the general charge of the Congress when the Department was established on May 15, 1862, 'to acquire and to diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of that word..." More specifically, the Research and Marketing act of 1946 authorizes "...research into the problems of human nutrition and the nutritive value of agricultural commodities, with particular reference to their content of vitamins, minerals, amino and fatty acids, and all other constituents that may be found necessary for the health of the consumer and to gains or losses in nutritive values that may take place at any stage in their production, distribution, processing, and preparation for use by the consumer..."

The GFHNRC was the first of the projected laboratories. Pertinent to its research program were several statements in the proposal (7), page 3, "The role of the so-called minor minerals in nutrition requires greater study"; page 6, "This research includes investigations relating to...nutrient requirements of persons at different stages and different conditions of life; the effects of nutrient balance, environmental conditions, and other factors on metabolic processes"; and page 14, "Special attention will be given to nutrients for which data are sparse or nonexistent and that recent research has demonstrated are important to man. Among these nutrients are mineral elements important in biological enzyme systems and in blood formation."

The USDA Committee on Agricultural Sciences (CAS) nutrition subcommittee reviewed Senator Young's Proposed Program (7) on January 4–5, 1963. The Committee opposed the establishment of new laboratories and suggested, "This area of need be met to considerable extent through grants and contracts with State institutions." On January 25, Chairman Myers of CAS sent a communication to the Secretary of Agriculture incorporating 4 recommendations relating to the strengthening of the Department's research program on food and nutrition (8). The reservations of CAS are notable, because there was no appropriation for the program in 1964.

The "Proposed Program" was considered in subsequent hearings of the Senate Committee on Appropriations for Agriculture. In 1966, Senator Young obtained an appropriation of \$50,000 for planning and in 1967 obtained an appropriation of \$583,000 for construction of the original building. However, the funds were transferred from ARS to Great Society programs in 1967 (9). The Senate Subcommittee on Agriculture restored \$490,000 in 1968 (10); thus, the subsequent low bid of \$581,861 for the construction project in 1969 exceeded available funds by ~\$92,000. At Senator Young's behest, the USDA provided additional funds (11).

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The original building (\sim 18,000 ft² or 1672.25 m²), with total planning and construction costs of ~\$633,000, was "completed" in 1969 and accepted in September of 1970 (Supplemental Table 1) (12). It was built on land donated by UND in close proximity to the medical school. The ground floor included 7 laboratories and offices, a small library/conference room, administrative offices, a storage room, and a mechanical room. The 2nd floor constituted of an austere clinical research facility that occupied space equivalent to about two-thirds that of the ground floor. It included 8 single (~60 ft² or 5.57 m²) bedrooms, a community toilet, washroom and shower, a treatment room, a nurse's station, a combined common and dining room (about 700 ft² or 65.03 m²), a metabolic kitchen, a clinical laboratory, and offices.

In September 1970 the UND School of Medicine and the ARS Human Nutrition Research Division hosted a symposium, Newer Trace Elements in Nutrition (13), to celebrate the completion of the new laboratory. The symposium organizers were Dr. Cornatzer, and Drs. Walter Mertz and Leon L. Hopkins of the USDA ARS Human Nutrition Research Division, Vitamins and Minerals Laboratory, Beltsville, MD. The some 180 celebrants included numerous internationally recognized trace element scientists, including Eric J. Underwood, Bert L. Vallee, Boyd L. O'Dell, Howard G. Ganther, Helen Cannon, James A. Halsted, Mattie R. Spivey-Fox, Klaus Schwarz, Walter Mertz, M. L. Scott, D. Mark Hegsted, Paul H. Weswig, Richard W. Luecke, Richard J. Doisy, and Nobel Laureate Edward A. Doisy.

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During the 1970s the physical facilities were improved incrementally by a total of \$854,321 of construction (12). Included was a human whole body counter for in vivo measurement of gamma-emitting isotopes and in 1975 the clinical research facility was enlarged by construction on the adjoining roof space to provide an exercise physiology laboratory and more kitchen and common rooms. In the late 1970s Senator Mark Andrews sponsored legislation that authorized \$3.5 million for construction of a new building attached to the old building. Bids for construction exceeded this amount; therefore, construction of the addition did not start until 1980. Senator Andrews subsequently obtained funds for completing the new facility and other additions to the old building that increased the floor space from $\sim 20,000 \text{ ft}^2$ to $\sim 77,000 \text{ ft}^2$ for a total cost of \$6.835 million. Initial construction of the new building begun in 1980 resulted in 2 floors of vivarium space with 1 floor underground, conference rooms, library, administrative offices, and public space becoming available for use in 1982. In the fall of 1983 the metabolic unit occupying the top 2 floors of the new building was completed. This area, first used in 1984, included 14 single bedrooms and associated amenities designed for projects of 6 mo or longer, a new clinical laboratory, a state-of-the-art metabolic kitchen, an enhanced exercise physiology laboratory, and exercise space. Completion of renovations and additions to the original building during the 1980s provided additional basic science laboratories and special use and equipment rooms.

Administrative relationships of the Center changed several times from 1970-90. Originally, it was designated the Grand Forks Human Nutrition Laboratory, a field station of the ARS Human Nutrition Research Division, Beltsville, MD, directed by Willis A. Gortner, PhD. In 1972 the Laboratory was transferred to the Dakotas Area, led by Claude H. Schmidt, PhD, of the North Central Region, led by Earl Glover, and was renamed the Human Nutrition Research Center. The Carter administration transferred the Center to a new organization, the USDA National Human Nutrition Program, directed by D. Mark Hegsted, PhD,

and the name was changed to the GFHNRC. The Reagan administration returned the GFHNRC to ARS. The Center is now part of the ARS Northern Plains Area.

Between 1971 and 1990, the Center had 2 Directors. Harold H. Sandstead, MD was the first (1971-84) and Forrest H. Nielsen, PhD, was the 2nd (1986–2001). During the 2-y interim, 2 senior scientists were in charge, Leslie M. Klevay, MD (1984-85) and Forrest H. Nielsen, PhD (1985-86). Administrative officers from 1971 to 1990 were Roger Borowski, Cecil Ewing, and Phyllis Groven.

The efforts of Senator Young and Representative/Senator Andrews resulted in incremental increases in the Center budget from supporting one experimental nutritionist, Forrest H. Nielsen, PhD, and maintaining the building in 1970 to \$5.5 million in 1984. Senator Quentin Burdick assured that the budget continued to grow; by 1990 it was \$8.2 million. Growth during the 1970s occurred to a large extent because of close attention by Senator Young and Representative/Senator Mark Andrews. The 1971 budget supported the addition of the director, a physician-clinical investigator, Harold H. Sandstead, MD; a biochemist, Gary W. Evans, PhD; and a clinical chemist, Kim P. Vo-Khactu, PhD. The 1972 budget allowed the addition of a physician, experimental nutritionist Leslie M. Klevay MD, SD in Hyg, and a biochemist, Gary J. Fosmire, PhD. Collaborative research was initiated with scientists at UND. The ~\$113,000 budget of 1973 enhanced the basic science effort. In 1974 Senator Young and Representative Andrews increased the budget to about \$600,000 (14). An immunologist, Robert S. Pekarek, PhD, was hired, and a chemist, Robert A. Jacob, PhD, replaced Dr. Khactu as director of clinical chemistry. Clinical research activities increased and collaborations relevant to intestinal absorption of zinc in humans were initiated with scientists at the University of Chicago School of Medicine. In 1975 the budget was ~\$1.03 million. An exercise physiologist, Henry C. Lukaski, PhD, joined the staff. The research program included 6 basic science Current Research in System (CRIS) units and 1 clinical research CRIS unit. The lead scientists and topics of the basic science units were: Nielsen, nickel and other ultra trace elements; Klevay, copper, cholesterol, and heart disease; Evans, facilitators of zinc and copper intestinal absorption; Pekarek, zinc, immunity, and inflammation; Sandstead and Fosmire, zinc and development and function of the brain; and Sandstead and Klevay, cadmium toxicity. Initially the clinical research unit involved Sandstead, Klevay, Jacob, a dietitian (Sally Reck, MS RD), and a head nurse. Later as support increased, the team included a metabolic unit physician, Juan M. Munoz, MD, who was later replaced by Wesley Canfield, MD, and Janet R. Mahalko, MS RD (later, Janet R. Hunt, MS, PhD, RD), who replaced Mrs. Reck, and various head nurses. Collaborators from UND included a physicist, Glen I. Lykken, PhD, a neuropsychologist, Donald M. Tucker, PhD, and statisticians, George Logan, MS and later LuAnn Johnson, MS. In 1976 the \$1.27 million budget supported adding Dr. Munoz and provided ~\$475,000 for the 6 basic science CRIS units and ~\$330,000 for the clinical research CRIS unit. The ~\$1.72 million for 1977 enhanced the above programs and a nutritional biochemist, David B. Milne, PhD, replaced Dr. Jacob. Staffing remained fairly static while the extensive additions were being made to the original facilities. Between 1986 and 1990, the increase in the budget to \$8.2 million supported 13 scientists, 5 post-doctorates, and 14 laboratory technicians and 10 secretarial and administrative staff as federal employees. Staff obtained through a Research Support Agreement with the UND provided services to perform metabolic unit studies (nurses,

dietary technicians, chaperones, clinical chemists, recruitment personnel, and psychologists), vivarium support, data processing, custodial work, and building maintenance. This staff of 138 included 25 students who filled most chaperone positions and provided part-time help in research laboratories. Senior scientists in 1990 included: Curtiss Hunt, Janet Hunt, Phyllis Johnson, W. Thomas Johnson, Leslie Klevay, Tim Kramer, Henry Lukaski, David Milne, Forrest Nielsen, James Penland, Phillip Reeves, Jack Saari, and Eric Uthus. Post-doctorates in 1990 were Dennis Bobilya, John Finley, Sean Lynch, Scott Smith, and Richard Vanderpool.

After Senator Young retired and Representative Andrews was elected Senator, his role in the development of the center increased. This was in part related to his impromptu visit accompanied by Mrs. Andrews to the Center in 1981. Mrs. Andrews was especially interested in research that discovered that a daily intake of 26 g of Waldron strain hard red spring wheat bran in leavened bread prepared from low-extraction wheat flour reproducibly decreased serum total and LDL cholesterol concentrations and increased the rate of blood glucose clearance of healthy men (15,16). The North Dakota Mill later sent Waldron hard red spring wheat bran to the Andrews home and Mrs. Andrews began preparing muffins containing the bran for the Senator and herself. The next time Mrs. Andrews had her annual medical examination, her serum cholesterol concentration was remarkably decreased. Senator Andrews also shared the hard red spring wheat bran with several senatorial colleagues. They also reported decreases in serum cholesterol concentrations. When Senator Andrews informed Dr. Sandstead of these events, he specifically noted the importance of human nutrition

Another person who may have influenced early growth of the Center was Secretary of Agriculture Earl L. Butz, PhD. He visited the Center in 1975 during a trip to Grand Forks for another purpose. When Dr. Sandstead learned the Secretary was coming to Grand Forks, he alerted Dr. Cornatzer. Subsequently, the Secretary's administrative assistant requested a visit to the Center. To facilitate the visit, Dr. Sandstead sent the Secretary background materials. The visit was a distinct surprise for senior ARS administrative persons who had reservations about an increase in human nutrition research. Those in attendance at the visit included the ARS Administrator, Talcott W. Edminster, North Central Region Administrator, Earl Glover, and Dakotas Area Director, Claude H. Schmidt, PhD. People representing the UND included President Thomas Clifford, Professor Cornatzer, and North Dakota State Senator Earl Strinden. Over a period of \sim 3 h, the Secretary inspected the Center, met each scientist, discussed research, and gave a 30-min talk concerning the importance of human nutrition research. His parting words to Mr. Edminster and Dr. Sandstead were to the effect that he was pleased.

The successful growth of the GFHNRC from a field laboratory into an internationally recognized trace element research center came about because of many factors. Noted above was the high interest and support of the North Dakota congressional delegation. Senior USDA nutrition scientists, especially Willis Gortner, Walter Mertz, D. Mark Hegsted, James Iacano, and Gerald Combs Sr, provided helpful advice and encouragement. ARS administrators, especially Dr. Claude Schmidt and Earl Glover, provided administrative guidance. Most important was the expertise, curiosity, creativity, industry, collegiality, honesty, and empathy of the scientists and support staff. Supplemental Tables 2–5 list the ARS scientists and trainees, and collaborators at cooperating universities from 1970 through 1990. Reports of their work that are available through the National Library of

Medicine and PubMed are cited in the respective Supplemental Tables. Not cited are publications listed in databases concerned with food and agriculture data and other nonbiomedical topics, symposium proceedings, and book chapters. Facilitating these accomplishments were the state-of-the-art resources for trace element research in experimental animals, the very low background whole body counter for γ -emitting isotopes, and the unique clinical research unit designed for highly controlled, long-term (≥ 6 mo) metabolic balance studies in humans. Data from the Center were used by the Food and Nutrition Board of the National Academy of Sciences Institute of Medicine and the WHO as background for dietary recommendations concerning several mineral elements.

In summary, the GFHNRC came about through the happy coincidence of Dr. William G. Cornatzer's and Senator Milton R. Young's altruistic concerns for human welfare. Dr. Cornatzer shared his vision with Senator Young, who took action that resulted in the creation of the Grand Forks Human Nutrition Laboratory and a precedent for the creation of additional Human Nutrition Laboratories (Centers) within ARS. When ARS scientists from the Human Nutrition Research Division were given the opportunity to prepare the "Proposed Program for Expanded Research in Food and Nutrition" for Senator Young, they did so in a clear and timely manner. They also undoubtedly contributed to the design of the original building. Dr. Walter Mertz took responsibility for initial staffing of the laboratory and then in his role as mentor provided valuable advice to the junior scientists who were attempting to create a viable research entity. The "Science Gods" must have looked favorably on the laboratory staff; together, they created an internationally recognized center of excellence in trace element research.

Other articles in this supplement include references (17–21).

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Literature Cited

- Young M. Letter to Cornatzer. Washington, DC: United States Senate; 1970:1.
- Cornatzer W. Agricultural Appropriations for 1963: Laboratory for Nutrition Research. Subcommittee of the Committee on Appropriations. 2nd ed. Washington, DC: US Government Printing Office; 1962. p. 1028–30.
- Young M. Agricultural Appropriations for 1963: Comment of Senator Young. Senate Subcommittee of the Committee on Appropriations. 2nd ed. Washington, DC: US Government Printing Office; 1962. p. 1030.
- Harwood T. Agricultural Appropriations for 1963: Importance of Diet Modification. Senate Subcommittee of the Committee on Appropriations. 2nd ed. Washington, DC: US Government Printing Office; 1962. p. 1031–34.
- Russell R. Agricultural Appropriations for 1963: Agricultural Research Service. Subcommittee of the Committee on Appropriations. 2nd ed. Washington, DC: US Government Printing Office; 1962. p. 1034.
- Stiebeling HK. Agricultural Appropriations for 1963: Agricultural Research Service. Subcommittee of the Committee on Appropriations. 2nd ed. Washington, DC: US Government Printing Office; 1962. p. 1035.
- Young M. Proposed Program for Expanded Research in Food and Nutrition. Washington, DC: US Government Printing Office; 1963. p. 1028–31.
- Myers W. A Resume of Recommendations from the Committee on Agricultural Sciences to the Secretary of Agriculture and Subsequent

NUTRITION

0F

JOURNAL

THE

- Actions in USDA. William J. Darby Papers. Nashville, TN: Eskind Biomedical Library, Vanderbilt University; 1963. p. 2.
- Anon. Young hits hold on nutrition lab funds. Grand Forks Herald; 1968.
- 10. Anon. Appropriation restored for nutrition laboratory. Grand Forks Herald; 1968.
- 11. Anon. Nutrition lab funds assured. Grand Forks Herald; 1969.
- 12. Govern P. FMIS Building Profile Report: Grand Forks Human Nutrition Research Center. In: ARS U, ed., 1988:3.
- 13. Mertz W, Cornatzer W, eds. Newer trace elements in nutrition. New York: Marcel Dekker; 1971.
- Associated Press. Joint committee okays \$1,296,000 for UND lab. Wahpeton Daily News 1973.
- 15. Munoz JM, Sandstead HH, Jacob RA, Logan GM Jr, Reck SJ, Klevay LM, Dintzis FR, Inglett GE, Shuey WC. Effects of some cereal brans and textured vegetable protein on plasma lipids. Am J Clin Nutr. 1979;32: 580-92.

THE JOURNAL OF NUTRITION

- 16. Munoz JM, Sandstead HH, Jacob RA. Effects of dietary fiber on glucose tolerance of normal men. Diabetes. 1979;28:496-502.
- 17. Dupont JL. Research in the Agricultural Research Service/USDA: introduction and early history. J Nutr. 2008;139:171-2.
- 18. Beecher GR, Stewart KK, Holden JM, Harnly JM, Wolf WR. Legacy of Wilbur O. Atwater: Human nutrition research expansion at the USDAinteragency development of food composition research. J Nutr. 2008; 139:178-84.
- 19. Combs GF, Sr. USDA Human Nutrition Center, 1978-82, and coordination of human nutrition research agencies. J Nutr. 2008;139: 185-7.
- 20. Nichols BL. Establishment of the USDA/ARS Children's Nutrition Research Center at Baylor College of Medicine and Texas Children's Hospital in 1978. J Nutr. 2008;139:188-91.
- 21. Rosenberg IH. History of the USDA Human Nutrition Research Center on Aging at Tufts University. J Nutr. 2008;139:192-3.